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Do Warmed Blankets Change Pain, Agitation, Mood or Analgesic Use Among Nursing Home Residents?

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ABSTRACT

Background: Pain, agitation, and thermal discomfort are common symptoms of older adults residing in nursing homes. Nonpharmacologic interventions are recognized as a best practice strategy for people living in nursing homes because of their low adverse effect profile and increased evidence of effectiveness. Warmed blankets have not been empirically tested for use in long-term care.
Aims: The purpose of this quality improvement project was to describe the use of warmed blankets in a nursing home setting and determine if use was associated with changes in pain, agitation, mood, or analgesic use.
Design: A pretest posttest design was used along with a comparison of intact groups.
Settings: The setting was one 160-bed skilled long-term care facility.
Participants/Subjects: There were 141 residents eligible since they did not have a condition that could be worsened by superficial heat.
Methods: Warmed blankets were unfolded and placed over residents with pain, agitation, or thermal discomfort. Short-term pain measures included use of the Revised FACES Pain Scale, the PAINAD (Pain Assessment in Advanced Dementia) scale, and the Brief Agitation Rating Scale. Long-term measures were taken from the electronic medical record.
Results: Of the 141 eligible residents, 24.1% (n = 34) received a warmed blanket over the 1- month study period. There were statistically significant decreases in both pain level and agitation among baseline, 20 minutes after application, and the subsequent shift assessments ($p < .001$). There were also long-term changes in the number of pain complaints ($p = .040$), severity of pain complaints ($p = .009$), and as-needed analgesic use ($p = .011$). There were no statistically significant differences between the treated group and comparison group on any long-term measures.
Conclusions: Warmed blankets are a low-cost intervention with a high potential for bringing comfort to nursing home residents.
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Pain is reported in 28%-82.9% of nursing home residents (Zanocchi, Maero, Nicola, & Martinelli, 2008; Zwakhalen, Koopmans, Geels, Berger, & Hamers, 2009), and agitation in 48%-82% (Zuidema, Koopmans, & Verhey, 2007). In addition, multiple studies report that older adults report more thermal discomfort and are less able to maintain body temperature when exposed to cold environments than younger adults (Kenney & Munce, 2003; van Hoof, Kort, Hensen, & Duijnstee, 2010).

Warmed blankets have not been empirically tested for use in long-term care. Warmed blankets are often used in hospital settings to promote thermal, physical, and psychological comfort (Park & Choi, 2010; Robinson & Benton, 2002; Wagner, Byrne, & Kolcaba, 2006). Warmed blankets have also been used by emergency transport staff with reports of decreased pain and anxiety from renal calculi and cholelithiasis (Kober, Dobrovits, Djavan, & Marberger, 2003a; Kober, Scheck, Tschabitscher, & Wiltschnig, 2003b). The purpose of this project was to determine (a) frequency of use of warmed blankets for pain, agitation, or thermal discomfort; (b) changes in pain, agitation, mood, or pro re nata (prn or as needed) analgesic use when a warmed blanket is provided for pain, agitation, or thermal discomfort in nursing home residents; and (c) differences over 1 month in pain, agitation, mood, or prn analgesic use between those receiving warmed blankets and a

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randomly selected comparison group who did not receive a warmed blanket.

Background

The most common source of pain in nursing homes residents is chronic musculoskeletal conditions. Among adults in the United States, nearly 27 million have clinical osteoarthritis, 59 million have had low back pain in the past 3 months, and 30.1 million have had neck pain in the past 3 months (Lawrence et al., 2008). More than 50% of nursing home residents have a diagnosis of dementia (Harris-Kojetin, Sengupta, Park-Lee, Valverde, & Caffrey, 2016). Nearly half of all people with dementia have agitation symptoms every month (Ryu, Katona, Rive, & Livingston, 2005). Eighty percent of those with symptoms remain agitated for longer than 6 months, and 20% of those without symptoms will develop agitation over 2 years (Savva, et al., 2009). Research has found that physical pain can present as agitation in people with dementia (Kovach et al., 2012; Sampson et al., 2015).

Multiple factors can contribute to an increased susceptibility to thermal discomfort in old age. Aging is associated with a diminished vasoconstrictor response and decreased cold-induced metabolic heat production (Kenney & Munce, 2003). Studies have shown that agitation of nursing home residents with dementia increased significantly when indoor air temperatures deviated from 22.6°C (72.7°F) and was particularly problematic when temperatures were greater than 26°C (78.8°F) or less than 20°C (68°F) (Tartarini, Cooper, Fleming, & Batterham, 2017). Diseases such as hypothyroidism, diabetes, and cardiovascular disease can affect body temperature (Kotas & Medzhitov, 2015). Certain medications can reduce blood flow and increase heat loss (Kiyatkin, 2013).

Nonpharmacologic interventions are recognized as a best practice strategy for people living in nursing homes because of their low adverse effect profile and increased evidence of effectiveness (Cabrera, Sutcliffe, Verbeek, Saks, & Soto-Martin, 2015). The heat from a warmed blanket may decrease musculoskeletal pain by increasing tissue blood flow and metabolism, changing viscoelastic properties of collagenous tissues, and decreasing muscle spasm (Cetin, Aytar, Atalay, & Akman, 2008; Lewis, Holmes, Woby, Hindle, & Fowler, 2012). A warmed blanket may decrease agitation by providing physical comfort and muscle relaxation. Evidence from the treatment of anxiety and phobias suggests that muscle relaxation or the distracting pleasant stimulus of a warmed blanket may be explanations for effectiveness (Conrad & Roth, 2007).

Although warmed blankets are considered safe, these should be used with care, and use should be avoided in some select situations. One case study reported signs of hypoventilation when an intraoperative patient with a fentanyl patch was given a warmed blanket (Frölich, Giannotti, & Modell, 2001). Possible variations in systemic absorption of transdermal medications when exposed to heat indicates that warmed blankets should not be used for anyone receiving transdermal medication. Superficial heat applications are avoided in acute injury, acute inflammatory conditions, some cancers, and conditions that may be exacerbated by heat, such as multiple sclerosis (Batavia, 2004).

Heat can be used to treat pain but can also cause pain. Results of studies examining if people with a dementing illness have different responses to noxious heat stimuli pain have reported mixed results. In two studies there was no difference in warmth detection or heat pain thresholds between those with Alzheimer's disease (AD) and healthy controls (Jensen-Dahm et al., 2015a,b). Fletcher et al. (2015) using temperature symptom questionnaires and voxel-based morphometry of patients' brain magnetic resonance images, found a heightened response to thermal pain testing in AD and semantic dementia and a blunted response with behavioral variant frontotemporal dementia. Monroe et al. (2016) reported that people with dementia had higher thresholds than controls for detecting warmth, mild pain, and moderate pain from heat. In this study people with AD felt weak pain at temperatures of 35-41°C (95-105.8°F), and moderate pain at 38-45° C (100.4-113°F) when heat was applied to the thenar eminence of the right hand. Another study by Monroe et al. (2017) found that people with AD had higher thermal thresholds for warmth and mild pain but similar thresholds to controls for moderate pain.

Methods

Design and Questions

This practice improvement project (PIP) was led by the Director of Nursing and Chief Operating Officer and conducted with the assistance of the Director of Research and Administrator-in-Training. Short-term changes in pain and agitation from baseline to 30 minutes after application of the blanket and to the next shift after application were examined. Comparisons were made from 1 month before to 1 month after warmed blanket use between those receiving the warmed blankets and a randomly selected group who did not receive a warmed blanket. The long-term outcomes measured for were the number of pain complaints, pain severity, prn analgesic use, agitation, and mood. The questions that guided this project are as follows:

1. What is the frequency of use of warmed blankets for pain, agitation, and thermal discomfort?
2. Is there a difference in pain or agitation level between baseline and 30 minutes or the next shift after the application of a warmed blanket?
3. Is there a difference in residents' number of pain complaints, pain severity, prn analgesic use, agitation, or mood from 1 month before treatment to 1 month after treatment with warmed blankets?
4. Is there a difference between residents receiving a warmed blanket and a randomly selected sample of those residents who did not receive a warmed blanket over the 1-month study period in the number of pain complaints, pain severity, prn analgesic use, agitation, or mood?

Setting and Sample

This project was conducted at one 160-bed skilled long-term care facility. Fifty of the 160 beds were designated for people receiving rehabilitation. The project was approved by the Institutional Review Board at the University of Wisconsin–Milwaukee as a quality improvement project that did not require individual written consent. Residents were eligible to receive a warming blanket unless they were using a transdermal drug or had an acute injury, acute inflammatory process, multiple sclerosis, open skin wound, or any other condition that might be worsened by superficial heat.

Warmed Blanket Intervention

Care was taken to meet the safety standards for using warmed blankets. A study by Kelly et al. (2013) stated that blanket warmers set to 150°F (65.6 °C) have an acceptable safety profile for clinical use based on findings of improved comfort and no epidermal damage at that temperature. For this study we chose to use the more conservative maximum temperature of 130°F (54.4°C), as set forth by the Emergency Care Research Institute (ECRI) for the clinical use of warmed blankets (ECRI Institute, 2014). The ECRI states on their website that although they do not believe that blankets warmed to 150°F are unsafe if unfolded, there have been multiple reports of patient burns resulting from blankets that were

in warmers set to greater than 130°F and then rolled or left folded when applied to the patients (ECRI Institute, 2014).

Electric HOTBAG Blanket Warmers (Check Healthcare, Troy, Michigan) were placed on each unit and used to warm flannel blankets, commonly called "bath blankets" by nursing home staff. The warmer was set to maintain a temperature of blankets no greater than 130°F (54.4°C). The temperature of the blankets in the warmers was checked 52 times using a Westward Infrared Thermometer (Westward Industries), yielding a temperature range of 94-132°F (34.4-55.6°C) (mean [M] = 108.11°F, standard deviation [SD] = 10.67). The person checking the temperatures (i.e., fourth author) noted that the blankets were warmer when there were no more than three blankets in the warmer. Although the blanket temperatures were higher than the previously described studies that yielded pain via direct application of thermal heat to the skin using a thermode, a study of blanket warmth and safety found that blankets warmed from 110° to 150°F (43-66°C) applied directly to the skin of healthy adults aged 25-55 of varying body types produced no overheating or burning (Bujdoso, 2009). In addition, blanket temperatures decreased to approximately 80°F (27°C) within 5 minutes, regardless of the initial temperature (Bujdoso, 2009).

Written instructions were provided on each unit that included the rationale for the project, who should and should not receive the warming blanket, and instructions for filling out the Practice Improvement Project (PIP) forms. Nurses and nursing assistants were trained by the director of nursing. Nurses and nursing assistants were instructed to offer a warmed blanket to residents who complained of pain or being cold or were having behavioral agitation. They were also encouraged to offer the warmed blankets for residents with other needs if they thought it might be helpful and to inform the PIP team of that use. Nurses were told they should use the warmed blanket as an adjunct to their usual care, rather than withholding any usual treatment. Blankets were unfolded and placed over the clothed person, with no additional barrier provided on the skin before the blanket being applied.

Measurement Procedures

Short-term Measures

Three-ring binders on the units housed the PIP instructions and assessment forms. Every time a warmed blanket was used, a PIP form was completed that documented the reason for using the blanket as well as pain and agitation levels for three time points (baseline, 30 minutes, and the next shift after the application of a warmed blanket). Pain was assessed using 0-10 scales. For people who could self-report, the Revised FACES Pain Scale was used (Ferreira-Valente, Pais-Ribeiro, & Jensen, 2011; Hicks, von Baeyer, Spafford, van Korlaar, & Goodenough, 2001). For those who could not self-report, the PAINAD (Pain Assessment in Advanced Dementia) observational scale was used (Warden, Hurley, & Volicer, 2003). Agitation was also assessed at the three time points using the Brief Agitation Rating Scale (Finkel, Lyons, & Anderson, 1993).

Long-term Measures

The medical record of each resident within the PointClickCare (https://pointclickcare.com/) platform was used to capture assessments of the number of pain complaints, pain severity, prn analgesic use, agitated behavior, and mood. Data were collected for two 30-day time points. For those who received a warmed blanket, data were collected for 30 days before use of the first warmed blanket and for the next 30 days. For those in the randomly selected comparison group, data were collected for 30 days before the blanket warmers being installed and for the next 30 days.

Pain assessments on a 0-10 scale were documented for each shift in the medication administration record. The number of pain complaints was a count of the number of days in a 30-day month that there was a pain assessment recorded greater than 0. To create a pain severity score, we counted the number of days in the month the highest pain score for the day was in the mild, moderate, or severe range. These frequencies were then weighted and summed. The frequency of mild pain scores was multiplied by 1, moderate was multiplied by 2, and severe by 3. The number of prn analgesics used was a count of doses given in the medication administration record for the two 30-day periods.

Thirteen agitated behaviors are assessed within the medical record: frequent crying, repeats movement, yelling/screaming, kicking/hitting, pushing, grabbing, pinching/scratching/spitting, biting, wandering, abusive language, threatening, sexually inappropriate, and rejection of care). The 10 items that are used to assess mood involved appetite; concentration; sleep; interest or pleasure in doing things; feeling down, depressed, or hopeless; feeling tired or having little energy; feelings of failure or low self-worth; activity level; ease of becoming annoyed; and wishing for death or attempting to harm self. The mood and behavioral symptom scores used for this project reflect the number of times over 30 days any of the behavioral or mood symptoms were documented as present in the resident's medical record.

Data Analyses and Results

Descriptive analyses included frequencies, percentages, means, medians, standard deviations, and ranges. Differences at baseline between those receiving the warmed blanket and the randomly selected comparison group were made using the χ^2 and t test statistics.

Because of skew in outcome measures, nonparametric inferential tests were used to answer questions 2-4. To answer question 2, the differences in pain and agitation between baseline, 20 minutes after application, and on the subsequent shift were analyzed with the Friedman's analysis of variance by ranks test. To answer question 3, the differences from 1 month before treatment to 1 month after treatment with warmed blankets were analyzed with the Wilcoxon signed rank test for related samples. Question 4 involved comparisons between those receiving the warmed blanket and the randomly selected comparison group and was computed using the Mann-Whitney U test.

Description of Sample

During the study period, 141 residents were eligible to receive a warmed blanket. Consistent with trends in long-term care, the sample as a whole was predominately female (n = 106, 75%), receiving skilled care (n = 98, 70%), and had a diagnosis of dementia (n = 97, 69%). The average age of the sample was 85.21 (SD = 11.70), though those receiving short-term rehabilitation were younger (M = 75.87, SD 14.06) than those receiving skilled care (M = 88.91, SD 8.19). The median length of stay was 36 months for those receiving skilled care (range 0-570) and was less than 1 month (range <1-19) for those receiving short-term rehabilitation care. The average number of painful diagnoses per resident was 3.12 (SD = 1.71). However, 54 (38%) residents had four or more diagnoses commonly associated with pain.

Warmed Blanket Use

Of the 141 residents eligible to participate, approximately one fourth (n = 34, 24.1%) received a warmed blanket over the 1-month study period. Those 34 residents had documentation that they received 73 warmed blankets, though the unit managers reported that repeated use of warmed blankets by some residents was underreported. Blankets were at times used for more than one reason and were used for pain 22 times, agitation 27 times, and

thermal comfort 29 times. No staff reported using a warmed blanket for another reason or any adverse effects from using the blankets.

Short-term Changes

We examined differences in short-term pain and agitation levels the first time the 34 residents received a warming blanket. There was a statistically significant difference in pain level between baseline, 20 minutes after application, and during the subsequent shift assessments ($p < .001$). The median pain score at baseline was 3 (range 0-10), 20 minutes after application was 0 (range 0-8), and during the subsequent shift was 0 (range 0-8). There was also a statistically significant difference in agitation level between baseline, 20 minutes after application, and during the subsequent shift assessments ($p < .001$). The median agitation score at baseline was 2 (range 0-12), 20 minutes after application was 0 (range 0-10), and during the subsequent shift was 0 (range 0-3).

As seen in Figure 1, pain ratings improved 20 minutes after application of the warmed blanket for 83% of residents treated for pain. Two residents treated for agitation who also had pain ratings greater than 0 both had their pain level improve 20 minutes after treatment was initiated, as did 75% of those treated for thermal comfort. Ratings on the next shift indicated that 93% of those treated with a blanket for pain had improved pain scores. Figure 2 shows that agitation ratings improved 20 minutes after application of the warmed blanket for 82% of residents treated for pain, for 77% of those treated for agitation, and for 93% of those treated for thermal comfort. Ratings on the next shift indicated that 91% of those treated with a blanket for pain had improved agitation scores. One hundred percent of those treated for agitation or thermal comfort had improved agitation scores during the next shift.

Examining all 73 applications of warming blankets, the median change in agitation ranged from 0 to 18 points (median = 3). Nine residents (26%) had their agitation decrease by 5 or more points. The median change in pain ranged from 0 to 12 (median = 1). Six residents (18%) had their pain decrease by 5 or more points.

Baseline to Posttest Long-term Changes

For those residents receiving one or more warmed blankets, comparisons were made of baseline readings in the medical record the month before using the blankets to the readings 1 month after the person received the first blanket. There were statistically significant differences from baseline to posttest readings in the number of pain complaints ($p = .040$), severity of pain complaints ($p = .009$), and prn analgesic use ($p = .011$). As seen in Figure 3, the median number of pain complaints and the pain severity both decreased after using the warmed blankets. The range of pain complaints and prn analgesics used also decreased after treatment. There were no statistically significant differences from baseline to the posttest month in mood ($p = .862$) or agitated behaviors ($p = .326$).

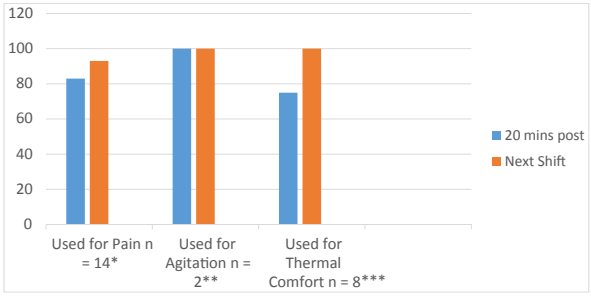

Figure 1. Percentage of residents with improved pain rating 20 minutes and the next shift. after first warmed blanket treatment (N = 34). *Fourteen residents received their first warm blanket for pain. ** Two residents who received their first warmed blanket for agitation had a pain rating >0. ***Eight residents who received their first warmed blanket for thermal comfort had a pain rating >0.

Comparisons of Long-term Measures Between Groups

We first examined similarity at baseline of the group of 34 that used warmed blankets to the 34 in the randomly selected comparison group. There were no statistically significant differences between groups at baseline in age ($t = 0.646$, $p = .521$), length of stay ($t = 1.278$, $p = .206$), painful diagnoses ($t = 0.393$, $p = .695$), gender ($\chi^2 = 0.540$, $p = .462$), or number with a dementia diagnosis ($\chi^2 = 0.017$, $p = .897$). We next compared differences in the 1-month long-term outcome measures taken from the medical record between the treated group and the comparison group. There were no statistically significant differences between the group who received one or more warmed blankets and those who did not on the number of pain complaints ($p = .761$), severity of pain ($p = .506$), prn analgesic use ($p = .172$), mood ($p = .603$), or agitation ($p = .724$).

Discussion

This is the first published project to our knowledge that describes the use of warmed blankets in older adults residing in a nursing home. Almost one-fourth of eligible residents used a warmed blanket over the 1-month project period. The blankets were used for pain, agitation, and thermal discomfort. The temperature of the blankets in the warmers varied, suggesting it may be prudent to check temperatures of blankets in the warmers and to be careful to not overfill the warmers with blankets.

This project provides some preliminary evidence that warmed blankets may be useful clinically in long-term care and rehabilitation settings for reducing short-term symptoms of pain and agitation. Based on anecdotal reports from the staff, it was clear within the first couple of minutes if the warmed blanket would be well received or rejected by people with dementia who were highly agitated. Also, the majority of residents who received warmed blankets for suspected pain were able to report a response within 20 minutes.

The number of people who improved was higher on the next shift than it was 20 minutes after application. This difference may indicate that it took more than 20 minutes to achieve effectiveness for some residents. Pain can lead to anxiety and increased muscle tension (Müller-Schwefe, & Uberall, 2008). More than 20 minutes may have been needed to achieve relief from pain caused by muscle tension. The increased improvement over time could also indicate a maturation effect in which the symptoms would have naturally diminished over this period of time, independent of the warmed blanket use.

In terms of long-term effectiveness, it appears to be clinically meaningful that those who received warmed blankets had decreases in three indicators of pain over 1 month. The three indicators were number of pain complaints, severity of pain, and the number of prn analgesics used over the month. Because this is a small study without a control group or highly controlled methods, the findings need to be replicated using more rigorous research methods. But the triangulation of similarly positive results on all three indicators of long-term pain that were measured is highly encouraging. Based on these results, the director of nursing at the facility decided to place a pop-up message in the electronic medical that encourages nurses to consider a trial with a warmed blanket before administering a prn medication. The blanket warmers are also being installed at other sites owned by the organization, including assisted living.

The failure to find long-term changes in agitation or mood is consistent with research showing short-term rather than long-term effectiveness of nonpharmacologic interventions to treat agitation (Livingston, et al., 2014; Vernooij-Dassen, Vasse, Zuidema, Cohen-Mansfield, & Moyle, 2010). Agitation is often a symptom of

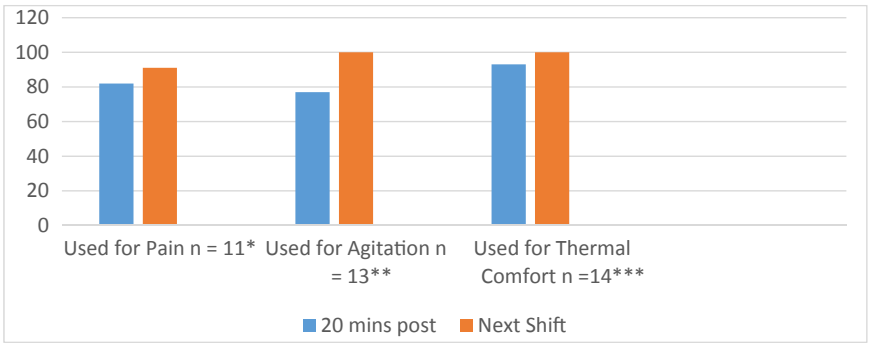

Figure 2. Percentage of residents with improved agitation rating 20 minutes and the next shift. after first warmed blanket treatment (N = 34). *Eleven residents receiving their first warmed blanket for pain had an agitation score >0. **Thirteen residents received their first warmed blanket for agitation. ***Fourteen residents who received their first warmed blanket for thermal comfort had an agitation rating >0.

pain (Achterberg et al., 2013). Research with a large sample and control of potential confounding variables is needed to determine how many people with agitation have pain and how many of those with pain can be effectively treated either solely or as an adjunct with a warmed blanket.

In addition to warmed blankets, weighted blankets have been used to treat pain and anxiety (Parker & Koscinski, 2016), and warm, wet towel blankets have been used to decrease the agitation of people with dementia during bathing (Gozalo, Prakash, Qato, Sloane, & Mor, 2014; Rader, Hoeffer, Sloane, & Biddle, 2008). One study (Chen, Yang, Chi, & Chen, 2013) suggested that activation of the parasympathetic system is the mechanism by which weighted blankets decrease anxiety, whereas another postulates that, for people with dementia, it is the sensory modulation effect of a weighted blanket that decreases agitation (Champagne, 2018).

Limitations

There were multiple limitations to this quality improvement study. The sample size was small, people were not randomly assigned to treatment and control conditions, and potential confounding variables were not controlled. The temperature of the warmed blankets was not controlled, and there was evidence of variability within the blanket warmers. Also, because blankets were placed over the clothed person, the amount of clothing worn would likely contribute to variability in the amount of warmth each person felt from the application of the blanket. There are multiple possible explanations for the lack of differences in long-term measures between the treated group and the randomly selected comparison group: (a) potential confounding variables, including the concurrent use of analgesics, were not controlled between groups; (b) the dose or temperature of warmed blankets received may not have been large enough to detect group differences; (c) the sample sizes in each group were quite small; and (d) the intervention may have minimal or negligible long-term effects.

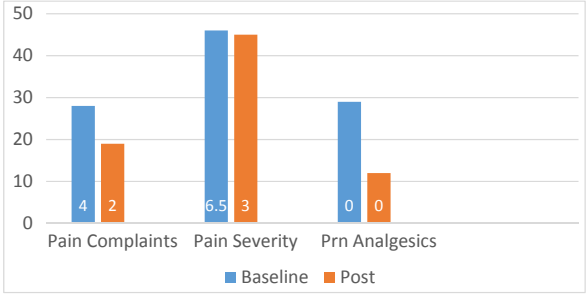

Figure 3. Changes in pain measure ranges and medians from baseline month to posttest month. Column length depicts the range of scores The number in the column is the median. prn = As needed.

Conclusions

Nonpharmacologic interventions are advantageous for use with older adults because of their low adverse effect profiles. The warmed blankets tested in this project have promise for reducing pain, short-term agitation, and thermal discomfort in residents of nursing homes. The results must be interpreted cautiously because this was not a controlled study and was conducted in only one nursing home. Warmed blankets are a low-cost intervention with a high potential for bringing comfort to nursing home residents.

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